

CLAIMS:

1. An adjustable radio frequency data communications device for use with a remote interrogator unit, the device comprising:

a monolithic semiconductor integrated circuit having integrated circuitry;

transmitter circuitry provided on the monolithic integrated circuit and forming at least part of the integrated circuitry;

an antenna electrically coupled to the transmitter circuitry and configured to communicate with the remote interrogator unit;

a power source electrically coupled to the integrated circuitry and configured to generate operating power for the communications device; and

at least one of the antenna and the transmitter circuitry having reconfigurable electrical characteristics, the electrical characteristics being reconfigurable to selectively tune the at least one of the antenna and the transmitter circuitry within a range of tuned and detuned states to realize a desired transmitter circuitry sensitivity.

2. An adjustable radio frequency data communications device in accordance with claim 1 wherein the transmitter circuitry has at least one circuit with at least one selectively tunable circuit element electrically reconfigurable to modify the transmission range of the transmitter circuitry.

3. An adjustable radio frequency data communications device in accordance with claim 2 wherein the at least one circuit comprises a plurality of fixed matching networks and circuitry configured to selectively switch one of the fixed matching networks into electrical connection with the transmitter circuitry in order to adjust tuning of the transmitter circuitry and the antenna.

4. An adjustable radio frequency data communications device in accordance with claim 2 wherein the at least one circuit comprises an adjustable circuit element which selectively causes the transmitter circuitry and the antenna to have mismatched impedances.

5. An adjustable radio frequency data communications device in accordance with claim 1 and further comprising receiver circuitry having at least one circuit with at least one selectively tunable circuit element electrically reconfigurable to modify the reception range of the receiver circuitry.

6. An adjustable radio frequency data communications device in accordance with claim 5 wherein the at least one circuit comprises a plurality of fixed matching networks and circuitry configured to selectively switch one of the fixed matching networks into electrical connection with the receiver circuitry in order to adjust tuning of the receiver circuitry and the antenna.

7. An adjustable radio frequency data communications device in accordance with claim 5 wherein the at least one circuit comprises an adjustable circuit element which selectively causes the receiver circuitry and the antenna to have mismatched impedances.

8. An adjustable radio frequency data communications device for use with a remote interrogator unit, the device comprising:

a monolithic integrated circuit including receiver circuitry configured to receive an interrogation signal from the interrogator unit;

an antenna electrically coupled to the receiver circuitry, the antenna configured to receive the interrogation signal from the interrogator unit and deliver the interrogation signal to the receiver circuitry;

a battery electrically coupled to the integrated circuit and configured to provide power to the receiver circuitry; and

at least one of the antenna and the receiver circuitry having reconfigurable electrical characteristics, the electrical characteristics being reconfigurable to selectively tune the at least one of the antenna and the receiver circuitry within a range of tuned and detuned states to realize a desired reception range of the communications device.

9. An adjustable radio frequency data communications device in accordance with claim 8 wherein the receiver circuitry has at least one circuit with at least one selectively tunable circuit element electrically reconfigurable to modify the reception range of the receiver circuitry.

10. An adjustable radio frequency data communications device in accordance with claim 9 wherein the at least one circuit comprises a plurality of fixed matching networks and circuitry configured to selectively switch one of the fixed matching networks into electrical connection with the receiver circuitry in order to adjust tuning of the receiver circuitry and the antenna.

11. An adjustable radio frequency data communications device in accordance with claim 9 wherein the at least one circuit comprises an adjustable circuit element which selectively causes the receiver circuitry and the antenna to have mismatched impedances.

12. An adjustable radio frequency data communications device in accordance with claim 8 and further comprising transmitter circuitry having at least one circuit with at least one selectively tunable circuit element electrically reconfigurable to modify the transmission range of the transmitter circuitry.

13. An adjustable radio frequency data communications device in accordance with claim 12 wherein the at least one circuit comprises a plurality of fixed matching networks and circuitry configured to selectively switch one of the fixed matching networks into electrical connection with the transmitter circuitry in order to adjust tuning of the transmitter circuitry and the antenna.

14. An adjustable radio frequency data communications device in accordance with claim 12 wherein the at least one circuit comprises an adjustable circuit element which selectively causes the transmitter circuitry and the antenna to have mismatched impedances.

15. An adjustable radio frequency data communications device for use with a remote interrogator unit, the device comprising:

a monolithic semiconductor integrated circuit having integrated circuitry;

transmitter circuitry provided on the monolithic integrated circuit and forming at least part of the integrated circuitry;

an antenna electrically coupled to the transmitter circuitry and configured to communicate with the remote interrogator unit;

a power source electrically coupled to the integrated circuitry and configured to generate operating power for the communications device; and

at least one of the antenna and the transmitter circuitry having reconfigurable electrical characteristics, the electrical characteristics being reconfigurable to selectively tune the at least one of the antenna and the transmitter circuitry within a range of tuned and detuned states to realize a desired transmitter range of the communications device in response to a command from the remote interrogator unit.

16. An adjustable radio frequency data communications device in accordance with claim 15 wherein the transmitter circuitry has at least one circuit with at least one selectively tunable circuit element electrically reconfigurable to modify the transmission range of the transmitter circuitry.

17. An adjustable radio frequency data communications device in accordance with claim 16 wherein the at least one circuit comprises a plurality of fixed matching networks and circuitry configured to selectively switch one of the fixed matching networks into electrical connection with the transmitter circuitry in order to adjust tuning of the transmitter circuitry and the antenna.

18. An adjustable radio frequency data communications device in accordance with claim 16 wherein the at least one circuit comprises an adjustable circuit element which selectively causes the transmitter circuitry and the antenna to have mismatched impedances.

19. An adjustable radio frequency data communications device in accordance with claim 15 and further comprising receiver circuitry having at least one circuit with at least one selectively tunable circuit element electrically reconfigurable to modify the reception range of the receiver circuitry in response to a command from the interrogator unit.

20. An adjustable radio frequency data communications device in accordance with claim 19 wherein the at least one circuit comprises a plurality of fixed matching networks and circuitry configured to selectively switch one of the fixed matching networks into electrical connection with the receiver circuitry, in response to the command from the interrogator, in order to adjust tuning of the receiver circuitry and the antenna.

21. An adjustable radio frequency data communications device in accordance with claim 19 wherein the at least one circuit comprises an adjustable circuit element which selectively causes the receiver circuitry and the antenna to have mismatched impedances.

22. An adjustable radio frequency data communications device for use with a remote interrogator unit, the device comprising:

- a monolithic integrated circuit including receiver circuitry configured to receive an interrogation signal from the interrogator unit;

- an antenna electrically coupled to the receiver circuitry, the antenna configured to receive the interrogation signal from the interrogator unit and deliver the interrogation signal to the receiver;

- a battery electrically coupled to the integrated circuit and configured to provide power to the receiver circuitry; and

- at least one of the antenna and the receiver having reconfigurable electrical characteristics, the electrical characteristics being reconfigurable, in response to a command from the interrogator unit, to selectively tune the at least one of the antenna and the receiver circuitry within a range of tuned and detuned states to realize a desired reception range of the communications device.

23. An adjustable radio frequency data communications device in accordance with claim 22 wherein the receiver circuitry has at least one circuit with at least one selectively tunable circuit element electrically reconfigurable to modify the reception range of the receiver circuitry.

24. An adjustable radio frequency data communications device in accordance with claim 23 wherein the at least one circuit comprises a plurality of fixed matching networks and circuitry configured to selectively switch one of the fixed matching networks into electrical connection with the receiver circuitry in order to adjust tuning of the receiver circuitry and the antenna.

25. An adjustable radio frequency data communications device in accordance with claim 23 wherein the at least one circuit comprises an adjustable circuit element which selectively causes the receiver circuitry and the antenna to have mismatched impedances.

26. An adjustable radio frequency data communications device in accordance with claim 22 and further comprising transmitter circuitry having at least one circuit with at least one selectively tunable circuit element electrically reconfigurable to modify the transmission range of the transmitter circuitry, in response to a command from the interrogator unit.

27. An adjustable radio frequency data communications device in accordance with claim 26 wherein the at least one circuit comprises a plurality of fixed matching networks and circuitry configured to selectively switch one of the fixed matching networks into electrical connection with the transmitter in order to adjust tuning of the transmitter circuitry and the antenna.

28. An adjustable radio frequency data communications device in accordance with claim 26 wherein the at least one circuit comprises an adjustable circuit element which selectively causes the transmitter circuitry and the antenna to have mismatched impedances.

29. A method of adapting a radio frequency data communications device for use with a remote interrogator unit, the method comprising:

providing transponder circuitry;

providing an antenna electrically coupled to the transponder circuitry for communicating with a remote interrogator unit; and

selectively tuning at least one of the antenna and the transponder circuitry within a range of tuned and detuned states to realize a desired sensitivity responsive to an interrogation signal transmitted by the interrogator unit.

30. The method of claim 29 wherein the step of selectively tuning comprises configuring electrical conduction of the transponder circuit.

31. The method of claim 29 wherein the transponder circuit is selectively tuned by electrically switching in one or more of a plurality of fixed circuit networks for realizing the desired receiver sensitivity of the communication device.

32. The method of claim 29 wherein the transponder circuit includes a circuit network, the method further including the step of selectively tuning the circuit network.

33. The method of claim 29 wherein the transponder circuit comprises a receiver circuit, and the step of selectively tuning comprises detuning the receiver circuit.

34. The method of claim 29 wherein the transponder circuit comprises a transmitter circuit, with the step of selectively tuning comprising detuning the transmitter circuit.

35. A method of adapting a radio frequency data communications device for use with a remote interrogator unit, the method comprising:

electrically coupling an active transmitter to an antenna, the transmitter defining at least a portion of a monolithic RFID integrated circuit configured to communicate with a remote interrogator; and

selectively tuning at least one of the antenna and the transmitter to a state selected from a range of tuned and detuned states to realize a desired transmitter range in response to a command transmitted by the interrogator unit.

36. A method in accordance with claim 35 wherein the transmitter has at least one circuit with at least one selectively tunable circuit element electrically reconfigurable to modify the transmission range of the transmitter.

37. A method in accordance with claim 36 wherein the at least one circuit comprises a plurality of fixed matching networks and circuitry configured to selectively switch one of the fixed matching networks into electrical connection with the transmitter in order to adjust impedance matching between the transmitter and the antenna.

38. A method in accordance with claim 36 wherein the at least one circuit comprises an adjustable circuit element which selectively causes the transmitter and the antenna to have mismatched impedances.

39. A method in accordance with claim 35 and further comprising a receiver having at least one circuit with at least one selectively tunable circuit element electrically reconfigurable to modify the reception range of the receiver.

40. A method in accordance with claim 39 wherein the at least one circuit comprises a plurality of fixed matching networks and circuitry configured to selectively switch one of the fixed matching networks into electrical connection with the receiver in order to adjust tuning of the receiver and the antenna.

41. A method in accordance with claim 39 wherein the at least one circuit comprises an adjustable circuit element which selectively causes the receiver and the antenna to have mismatched impedances.

42. A method of adapting a radio frequency data communications device for use with a remote interrogator unit, the method comprising:

electrically coupling a backscatter receiver to an antenna, the receiver defining at least a portion of a monolithic RFID integrated circuit configured to communicate with a remote interrogator; and

selectively tuning at least one of the antenna and the receiver to a state selected from a range of tuned and detuned states to realize a desired reception range in response to a command transmitted by the interrogator unit.

43. A method in accordance with claim 42 wherein the receiver has at least one circuit with at least one selectively tunable circuit element electrically reconfigurable to modify the reception range of the receiver.

44. A method in accordance with claim 43 wherein the at least one circuit comprises a plurality of fixed matching networks and circuitry configured to selectively switch one of the fixed matching networks into electrical connection with the receiver in order to adjust impedance matching between the receiver and the antenna.

45. A method in accordance with claim 43 wherein the at least one circuit comprises an adjustable circuit element which selectively causes the receiver and the antenna to have mismatched impedances.

46. A method in accordance with claim 42 and further comprising a transmitter having at least one circuit with at least one selectively tunable circuit element electrically reconfigurable to modify the reception range of the transmitter.

47. A method in accordance with claim 46 wherein the at least one circuit comprises a plurality of fixed matching networks and circuitry configured to selectively switch one of the fixed matching networks into electrical connection with the transmitter in order to adjust impedance matching between the transmitter and the antenna.

48. A method in accordance with claim 46 wherein the at least one circuit comprises an adjustable circuit element which selectively causes the transmitter and the antenna to have mismatched impedances.

49. An adjustable radio frequency data communications device for use with a remote interrogator, the device comprising:

a monolithic integrated circuit including a receiver configured to receive an interrogation signal from the interrogator unit, and including a backscatter transmitter;

an antenna coupled to the receiver;

a battery electrically coupled to the integrated circuit and configured to provide power to the integrated circuit; and

the receiver having a plurality of fixed matching circuits and circuitry configured to selectively switch one of the fixed matching circuits into electrical connection with the receiver circuitry in order to adjust tuning of the receiver circuitry and the antenna to realize a desired reception range of the communications device, in response to a command from the interrogator.

50. An adjustable radio frequency data communications device in accordance with claim 49 wherein at least one of the fixed matching circuits is configured to cause the receiver and the antenna to have mismatched impedances.

51. An adjustable radio frequency data communications device in accordance with claim 49 wherein the integrated circuit further includes a transmitter having at least one circuit with at least one selectively tunable circuit element electrically reconfigurable to modify the transmission range of the transmitter, in response to a command from the interrogator unit.

52. An adjustable radio frequency data communications device in accordance with claim 51 wherein the at least one circuit comprises a plurality of fixed matching networks and circuitry configured to selectively switch one of the fixed matching networks into electrical connection with the transmitter in order to adjust tuning of the transmitter circuitry and the antenna.

53. An adjustable radio frequency data communications device in accordance with claim 51 wherein the at least one circuit comprises an adjustable circuit element which selectively causes the transmitter circuitry and the antenna to have mismatched impedances.